

COMPARATIVE COSTS OF THE MEDICAL CARE OF AVIATORS

An attempt has been made to assess both the direct and indirect costs involved in the medical care of aviators. The data that have been assembled range from verified figures to estimates based on the best available information. We have compared the cost of the current system of medical support with the projected cost of the ABC program and feel that the new program would be cost effective as well as providing superior medical care.

Our present physical examination system is antiquated when reviewed in light of recent technological developments involving automated equipment and procedures and new physiologic measurements. These developments have been successfully evaluated and utilized by major examining centers such as the Kaiser-Permanente group in California. In addition, this concept has recently been accepted by the Public Health Service for the projected "Preventacare" program. By utilization of these techniques the total care of the aviator can be greatly enhanced at substantial savings.

We have examined the comparative costs under the following headings:

1. Selection

- A. Medical Disqualifications

There will be no initial change in the cost of medical disqualifications with the institution of the new comprehensive system. However, after the ABC program has been in effect a sufficient amount of time, better selective measures should be forthcoming from newly developed stress tests, thereby reducing the initial selection costs by sharpening the selection battery.

2. Flight Training

A. Disqualifications (Appendix A)

In fiscal year 1965 182 student naval aviators were disqualified for medical reasons at a cost of \$2,017,130 or \$11,083 per drop (Appendix B). Forty-two of the men were found to be not aeronautically adapted and 140 not physically qualified for the program. Seventy-seven of these disqualifications came after their NAMI entrance flight physical examination.

B. Medical Absenteeism (days not flying)

a. Morbidity at the local unit due to

- 1) Self medication
- 2) Sick call visits
- 3) Sick in quarters
- 4) Operational nonavailability

To obtain these data an analysis was made of the "up-chits" received from three busy training fields. The analysis revealed 143 man days per month per station of "grounded time" (Appendix C). This amounted to .68% of the total aviator time at the stations. However, we are sure that the lost time recorded by the up-chits is just a small fraction of the actual medical absenteeism. We have been unable to ascertain the actual reliability of this measurement but feel that it reflects only about 50% of the actual official grounding time. If this is true then the proportion of "time grounded" at the local stations would approach $1\frac{1}{2}\%$. The major problem in medical absenteeism however involves

those instances where no official action is taken, for example, lost time due to self-medication, sick call visits, and periods SIQ which have been handled unofficially through the flight surgeon, schedules, or operations officer. Again, we are sure that the estimated $1\frac{1}{2}\%$ of recorded "official" grounding time is less than half of the unofficial absenteeism due to medical causes and consequently a conservative estimate for all medical absenteeism would approach 3% of pilot time per air station. If this figure is placed in the framework of the total wages paid to all naval aviators it would amount to \$8,278,200 a year as a minimum figure. Under our current reporting system these figures are admittedly the roughest of estimates. Even though this is a major medical problem, no better data are available. Under the ABC program, with careful medical monitoring by the local flight surgeon via the Care of Flyer report, we would have a much better evaluation of each pilot's availability. This information would be readily accessible for analysis on an individual basis or in an epidemiologic sense for the entire Navy and would quickly identify problem areas for further study.

b. Morbidity (hospital) (Appendix D)

We have combined our analysis of hospital morbidity for the training phase and for the operational phase. In fiscal 1965 480 aviators were admitted to the sick list at a total cost of \$770,400 in lost time and hospital costs.

b. Mortality (from BuMed N cards)

1) Aircraft accidents (Appendix E)

There were 14 deaths as a direct result of training, costing \$6,335,775. We have information that 2 of the deaths were felt to be due to "disorientation" at a cost of \$727,000, and 5 of the other deaths had secondary medical factors which were described as "distraction," "preoccupation," etc., at a cost of \$2,232,000. If we assign a 10% medical liability to this latter group another \$223,200 would be added.

C. Operational Costs

a. Medical disqualifications due to failure to meet standards on physical examinations (Appendix F)

In 1966 104 men were rejected or reclassified as a result of failure to meet standards on their physical examinations. We were unable to determine the exact dollar loss to the Navy by their removal from or reassignment to a lower flying category. However, if an average replacement figure of \$250,000 per replacement is accepted and only 50% of those 104 men were effectively removed from flying the cost to the Navy would be \$13,000,000.

b. Medical Absenteeism

1) Morbidity local unit

- a) self medication
- b) Sick call visits
- c) Sick in quarters
- d) Operational nonavailability

The information given under the flight training section is a combination of both the flight training and operational phase and covers this area.

2) Morbidity (hospital)

These data have also been combined under the flight training figures.

3) Mortality

In fiscal 1966 98 aviators were killed in aircraft accidents. The primary cause factor was the pilot in 42.1% of these accidents. Five accidents were due primarily to medical causes, the losses included 4 jet aircraft and 1 helicopter at a cost of \$2,306, 577, and a pilot replacement cost of \$1,250,000. In addition, in 27 other aircraft accidents there was a significant secondary medical cause. These accidents cost \$19,617,221 for the aircraft with \$6,750,000 for pilot replacement. If we again assume only a 10% medical liability in these accidents it would add an additional \$2,636,722 to the previous totals. (Aviation Safety Center Statistics).

c. Disease

In fiscal 1966 16 naval aviators died of disease. Six of these were due to arteriosclerotic heart disease, 3 to neoplastic disease of the skin, lung, and colon, 2 to aneurysms, and the remaining five due to infection, phlebitis, pulmonary infarct, diverticulitis, and uremia.

COMPREHENSIVE PHYSICAL EXAMINATION VERSUS CURRENT PRACTICES

An analysis of our current costs for the aviation physical examination division of NAMI, not including depreciation of capital investment, reveals that each examination costs approximately \$40.00. This is unusually low when compared with costs in the field because the NAMI physical examination division is a highly specialized, well organized group devoted solely to this function. The cost in the field would rise to approximately \$50.00 per examination. If the current cost for all annual aviation physical examinations is computed for a 39-year career, from ages 23 to 62, the total cost would be \$1,940. The cost estimate for the comprehensive physical examination under the ABC plan includes a capital outlay of \$400,000 for new equipment and installation. We understand that we will initially be able to utilize hospital space to begin the examinations on the incoming students and that following the construction of the new Pensacola Naval Hospital, that a portion of the old hospital will be available for laboratory space and a metabolic holding area. This area can be utilized with a minimum of construction costs. In addition, the operating cost would increase about \$97,000 per year. This would include 13 new civil service positions at \$80,500 per year with routine supplies of \$12,000 a year and an additional \$4,800 annually for automated laboratory supplies. The maintenance cost for the incoming student naval aviators for 6 extra days would equal \$217,000 annually. These costs, when divided among the 3,000 pilot input would equal about \$145.00 per man. Therefore the initial entrance physical examination would rise from approximately \$40.00 to \$145.00 per student.

This differential would be counteracted in the subsequent 8 year period by utilization of an abbreviated annual physical examination called the "Short Form." (The rationale for this form is discussed in Appendix F). The cost for these interval examinations would fall from \$50. to \$22. per year per pilot. (Appendix G)

Eight years after the ABC program has begun the first group will return for their second comprehensive examination and at that time the cost for each subsequent comprehensive examination will rise to \$280. (Appendix H). Therefore the total cost for the comprehensive ABC plan over a 39-year career, from ages 23 to 62, would be \$2,551.00, an increase of \$600. over the present limited system.

If we are able to reduce the pilot time involved in the annual short-form physicals to 1 hour versus the present 4 hours a full flight schedule may be maintained. This is equivalent to saving $\frac{1}{2}$ day per pilot per year or a total of 36 pilots per year. If this saving is prorated over a 15 year period it would equal \$600,000 a year in training costs and \$350,000 yearly in pay (Appendix I). In addition there would be a saving of 34,082 man hours of hospitalman time equivalent to \$77,025 per year.

The saving in pilot and corpsman time would amount to over \$1,000,000 a year. If we prorate the \$600. extra cost involved in the ABC program over a 39-year career we find that it amounts to a little less than \$15. per year per pilot. This would amount to about \$400,000 per year for the total aviator population. It would appear therefore that we could expect a savings of approximately \$600,000 a year in addition to the marked improvement in the examination and in the ancillary reduction in absenteeism and accidents that would follow from this type of comprehensive plan.

APPENDIX A

Medical Causes For Student Aviator and NFO Attrition

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the U.S. Naval Aerospace Medical Institute on 23 August 1966.

A review of our data on medical attrition has shown a slow but perceptible decrease in the percentage of candidates dropped from the program for medical reasons from July 1, 1963 to July 1, 1966. For simplicity, I have attempted to present this data in a variety of formats to illustrate several important facets of the problem. I think the most important correlation regarding the efficiency of our screening examinations shows the percentage of disqualifying medical defects (medical attrites/total student aviation physical examinations) that we felt should have been detected prior to reporting to Pensacola. We have made every attempt to give the benefit of the doubt to the outlying activities; if there was any question, the defect was considered undetectable. As an example, Chart I shows the flow of student attrition for fiscal 1965. From it, we can see that of the 3,832 candidates that reported to our physical examination division for flight physicals, 233 or 6.1 per cent were disqualified. We determined that 90 of these who were disqualified should have been screened before reaching Pensacola.

Table I shows the activities involved in the initial screening of these defects by rank order. As will be noted, the Naval Air Stations lead the list with 119 disqualifications, 50 per cent of which should have been detectable. In the second place was the Naval Aerospace Medical Institute with 51 disqualifications. However, only 4 per cent of these were previously detectable, in that the majority of cases involved neuropsychiatric problems which arose under the early stresses of the training program.

Tables II and III show the same breakdown for fiscal '64 and '66, and again the rank order for the major examining centers is retained. Of course, we realize that the Naval Air Stations and NARTU's are doing the vast majority of our screening examinations and consequently, if the total number of applicants examined were compared with the defects that were missed, I am sure the apparent wide division of the activities would be much less obvious. Probably a better indicator of the efficiency of the screening centers can be obtained by noting the per cent of detectable defects that were allowed to continue on to Pensacola. However we analyze the data, we note that the percentage of medical disqualifications has steadily fallen from 8.7 per cent in 1964 to 6.1 per cent in 1965 and 5.8 per cent in fiscal 1966.

In Table IV, we have subdivided the disqualifying defects by the specialty involved in rank order. It immediately becomes apparent that for each year Ophthalmology, Ear, Nose, and Throat, and Psychiatry lead the list, with the remaining specialties contributing much less to the problem. The question that immediately arises is--what specific defects are being missed most frequently in each of these specialties? In an attempt to answer this question, we have tabulated our most recent data from June 1 to July 29, 1966 and these are presented in Table V.

During this period, 24 cases were disqualified by Ophthalmology and 21 or 87 per cent of these should have been picked up on previous examinations. A breakdown by specific diagnosis reveals that defective depth perception led the list with 6 cases. This was followed by defective visual acuity which was not correctible to 20/20 in 4 cases, and then there were 3 cases

of defective color vision. Following this we had 2 cases of defective visual acuity which were correctible to 20/20 but were not acceptable as SNA. There were 2 cases of excessive esophoria, 2 cases of keratoconus, and 1 case of defective accommodation. There was also a case of presenile macular degeneration and 1 of amblyopia exanopsia.

The ENT Department during this period disqualified 13 cases, 10 of which, or 76 per cent, should have been picked up on previous examinations. They were, by rank order, 4 cases of sinusitis, 3 cases of allergic rhinitis, 2 cases of deflection of the nasal septum with inadequate airway, and one each of conduction deafness, perceptive deafness, inability to valsalva, and marked hypertrophy of the turbinates.

Running a close third was Psychiatry with 11 disqualifications, 1 of which or 9 per cent should have been picked up on previous examination. The breakdown of these disqualifications revealed 3 cases of emotionally unstable personality, 2 cases of motion sickness, 2 cases of psychophysiologic musculoskeletal reaction, 1 case of adult situational reaction with somatization, one case of conversion reaction, 1 case of psychophysiologic cardiovascular reaction, and 1 case of somnambulism.

During this two-month period, there were 6 orthopedic disqualifications, 2 or 33 per cent were previously detectable. The diagnoses included a symptomatic fracture of the sesamoid bone, an aseptic necrosis of the lunate, a genu recurvatum which was symptomatic, a bony and fibrous coalition between the os calcis and the navicular, a recurrent dislocation of the shoulder, and old burn scars of the lower extremities causing limited range of motion.

Our Cardiology Branch disqualified five cases, 3 of which or 60 per cent should have been previously detected. Among the diagnoses were 2 cases of essential hypertension, 2 cases of asthma, and 1 case of persistent albuminuria.

The surgeons also disqualified two cases, both of which should have been detected on prior screening examinations. One had an indirect inguinal hernia and the other a large thyroid mass with a contiguous cervical mass. The total defects for this two-month period therefore equaled 61 and 39 of these were previously detectable for an overall average of 64 per cent.

It is apparent from the tables presented here and from a comparable study done ten years ago that about fifty per cent of the disqualifying defects could have been detected in the screening centers. There are a multitude of reasons why these defects were missed. In some cases, the applicants knew they had the defects but either intentionally or unintentionally failed to mention them at the time of their initial interview and they were not discovered in the course of a routine examination. However, in a number of cases, the applicants stated that they told the examiners about the defects and were either told that it was of no concern or that he should "keep it quiet" if he wanted to enter the program.

We realize that in many cases inexperienced personnel do much of the screening; consequently, it is mandatory that the medical officer set up a training course to familiarize his men with not only the standards as set forth by BuMed but with the total philosophy behind these standards. We know that the majority of these applicants who have been misadvised at the screening centers have been given false

encouragement out of a sense of compassion. For example, we recently had to disqualify a student naval aviator who had a large nevus flammeus covering much of his face with extension into his mouth, ear, and scalp. Not only was this a disfiguring defect but it could have been associated with intracranial defects that were potentially dangerous. In this case, we not only had to deal with a bitterly disappointed applicant but also with an irate and very vocal parent.

I think the two areas that need the most careful study involve the simple mechanics of the eye examination and the doctor's interview. A review of the disqualifications by our Ophthalmology Department reveals that a good technician, much less a physician, would have picked up the majority of the defects. Therefore, constant rechecking and training of these technicians are mandatory.

In his interview, the physician should emphasize the fact that the candidates will be examined and re-examined repeatedly during their training and service years and if they have some defect that might disqualify them, it will be discovered sooner or later. Consequently, they would save themselves a tremendous amount of hard work and heartache if they would discuss it with the initial examiner so that he could evaluate it and suggest an appropriate course of action. If any questions arise that the examiner feels needs further consultation, we would be delighted to furnish what help we can through our Aviation Examining Division. I would urge all the medical examiners to feel free to call or write as the occasion presents itself. By working together on this problem, I am sure we can increase the number of defects screened prior to the inception of training and thereby effect an appreciable saving both in money and manpower that can well be used elsewhere in the program.

ATTRITION ——— FISCAL 1965
TOTAL APPLICANTS REPORTING (3832)

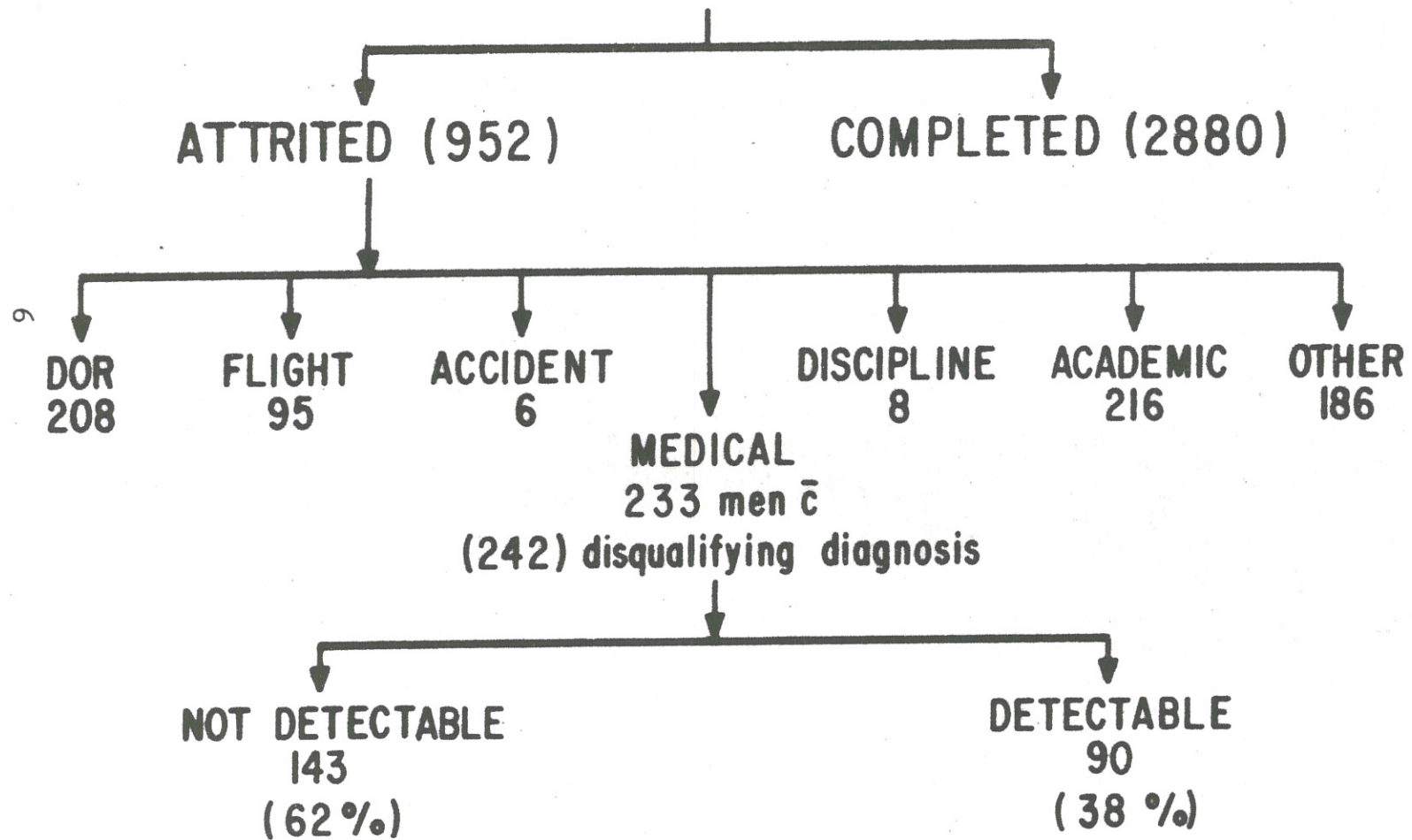


Table I
Medical Disqualification by Screening Activities
Fiscal '65

Activity	No. Disqualified	Previously Detectable	Per Cent
NAS	119	60	50
NAMI	51	2	4
NARTU	22	7	31
NS	10	6	60
MCAS	10	5	50
NAVAL ACAD	5	1	20
AIR FORCE	4	2	50
NAV HOSP	2	1	50
NAAS	1	0	0
COAST GUARD	1	0	0
MC BASE	1	1	100
UNKNOWN	7	5	71
TOTAL	233	90	38

Total physical examinations 3832. Medical disqualifications 233 or 6.08%.

Table II
Medical Disqualification by Screening Activities
Fiscal '64

Activity	No. Disqualified	Previously Detectable	Per Cent
NAS	183	127	69
NAMI	39	3	7
NARTU	31	24	77
AIR FORCE	11	8	72
MCAS	11	7	63
NS	6	3	50
MCAF	5	4	80
NAVAL ACAD	4	4	100
CVA	4	3	75
NAF	3	0	0
NAAS	2	0	0
NATTU	1	0	0
NRS	1	1	100
UNKNOWN	11	8	72
TOTAL	312	192	61

Total physical examinations 3600. Medical disqualifications 312 or 8.66%.

Table III
Medical Disqualification by Screening Activities
Fiscal '66

Activity	No. Disqualified	Previously Detectable	Per Cent
NAS	130	84	64
NAMI	45	1	2
NARTU	19	10	52
MCAS	15	11	73
NS	5	5	100
AIR FORCE	3	1	33
NAAS	3	1	33
NAVAL ACAD	2	0	0
CVA	2	1	50
AFES	1	1	100
NAF	1	1	100
MCAF	1	0	0
UNKNOWN	5	1	20
TOTAL	232	117	50

Total physical examinations 3968. Medical disqualifications 232 or 5.85%.

Table IV

Medical Disqualification by Diagnosis

Diagnosis by rank	Fiscal '66	Fiscal '65	Fiscal '64
Ophthalmology	77	65	94
ENT	65	61	89
Psychiatry	47	60	95
Orthopedic	16	16	26
Neurology	10	14	4
Cardiology	9	10	8
Surgery	6	-	-
Gastroenterology	5	1	7
Weight	3	2	9
Dermatology	2	2	-
Dental	1	-	9
Urology	1	9	6
Pulmonary	-	1	1
Height	-	-	3
Metabolic	-	1	1
Hematology	-	-	-
Total	242	242	352

Table V - Part A

Disqualification by System and Diagnosis, June 1 to July 29, 1966

Ophthalmology-- 24 cases; 21 cases or 87% should have been picked up on previous examination.

- a) Defective depth perception-- 6 cases
- b) Defective V.A. NOT correctible to 20/20-- 4 cases
- c) Defective color vision-- 3 cases
- d) Defective V.A. correctible to 20/20-- 2 cases
- e) Excessive esophoria-- 2 cases
- f) Keratoconus-- 2 cases
- g) Defective accommodation-- 1 case
- h) Presenile macular degeneration-- 1 case
- i) Amblyopia exanopsia-- 1 case

ENT-- 13 cases; 10 cases or 76% should have been picked up on previous examination.

- a) Sinusitis-- 4 cases
 - b) Allergic rhinitis-- 3 cases
 - c) Deflection nasal septum with inadequate airway-- 2 cases
 - d) Deafness conductive-- 1 case
 - e) Deafness perceptive-- 1 case
 - f) Inability to valsalva-- 1 case
 - g) Marked hypertrophy turbinates-- 1 case
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Table V - Part B

Psychiatry-- 11 cases; 1 case or 9% should have been picked up on previous examination.

- a) Emotionally unstable personality-- 3 cases
- b) Chronic and acute airsickness-- 2 cases
- c) Psychophysiologic musculoskeletal reaction-- 2 cases
- d) Adult situational reaction with somatization-- 1 case
- e) Conversion reaction-- 1 case
- f) Psychophysiologic cardiovascular reaction-- 1 case
- g) Somnambulism-- 1 case

Orthopedics-- 6 cases; 2 cases or 33% should have been picked up on previous examination.

- a) Fracture of sesamoid, symptomatic-- 1 case
- b) Aseptic necrosis lunate bone-- 1 case
- c) Genu recurvatum, symptomatic-- 1 case
- d) Bony and fibrous coalition between the os calcis and navicular
-- 1 case.
- e) Recurrent dislocation right shoulder-- 1 case
- f) Old burn scars of lower extremities causing limited range of motion
-- 1 case

Cardiology-- 5 cases, 3 cases or 60% should have been picked up on previous examination.

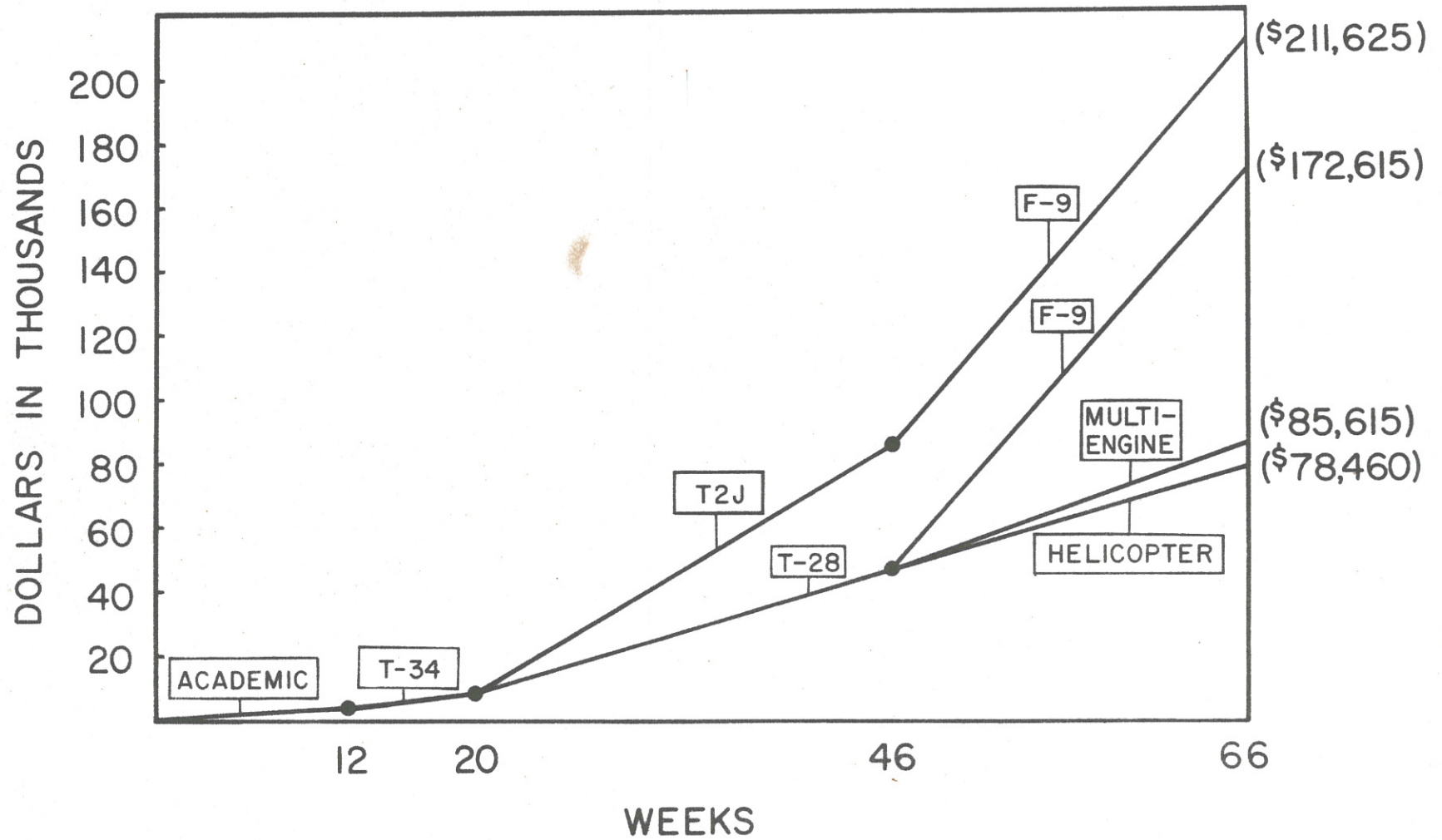
- a) Essential hypertension-- 2 cases
- b) Asthma-- 2 cases
- c) Persistent albuminuria-- 1 case

Surgery-- 2 cases; 2 cases or 100% should have been picked up on previous examination.

- a) Indirect inguinal hernias-- 1 case
- b) Thyroid mass + cervical mass-- 1 case

Total defects for this period 61, 39 or 64% should have been picked up on previous examination.

CUMULATIVE TRAINING COSTS PER STUDENT PILOT



APPENDIX C

Cost of Grounding as Obtained from "Up-Chits"

An average from 3 busy fields = 143 man days/month/station "grounded time"

Using NAAS Whiting Field

Total work time= 700 pilots x 30 days or 21,000 man days/month/station

$$\frac{143}{21000} = .68\% \text{ of available time}$$

Therefore:

For the total naval air arm

$$28,000 \text{ pilots} \times \$27.00/\text{day} \times 365 \text{ days/year} = \$275,940,000$$

$$\text{Lost to grounding } .68\% \text{ OR } \$1,876,392$$

APPENDIX D

Aviator In-Patient Days for Six Month Period July 1965 to January 1966

Pilots = 240 Average number days/pilot 22.3

$240 \times 22.3 = 5352 \text{ man days} \times 2 = 10,704 \text{ man days/year}$

$10,704 \text{ man days} \times \$27.00/\text{day} = \$288,900.00 \text{ Wages}$

$10,704 \text{ man days} \times \$45.00/\text{day} = \underline{\$481,500.00 \text{ Hospital Cost}}$

for total cost to Navy \$770,400.00

APPENDIX E

Aircraft Accidents/Training Command

Name and Plane Make	Cause	Cost		
		Aircraft	Pilot	Total
NALLS, Michael A. ENS., T-28C	(DISORIENTATION) Undetermined with pilot as the most probable contributing cause	\$139,000	\$ 16,260	\$155,260
KITCHENS, Jack G., Jr., LTJG, TF-9J	(DISORIENTATION) Undetermined with pilot as the most probable contributing factor	398,000	173,680	571,680
ENGLISH, Richard G. 2nd Lt., T-28B	(DISTRACTION or inattention) Undetermined with pilot as most probable contributing factor	142,000	11,210	153,210
WILSON, Ted Ellis Navcad, TF-9J	(PREOCCUPIED at critical moment, improper preflight, and misuse of throttle control) Pilot	398,000	213,750	611,750
WILHELM, Klaus P. ENS, T-28C, T-28B	(PREOCCUPIED) Student failed to see preceding a/c in pattern. Other personnel failed to initiate wave-off from poor approach	139,000 142,000	31,890	312,890

Name and Plane Make	Cause	Cost		
		Aircraft	Pilot	Total
RODRIGUEZ, Jose S.	(MIS-JUDGED DISTANCE during rendezvous)	\$142,000	\$ 31,890	\$315,890
USMCR, 2 T-28's	Pilot	142,000		
WISMER, Henry R.	(FAILED TO RECOGNIZE A DANGEROUS SITUATION)	346,000	146,245	838,245
ENS, 2 AF-9J's	and take appropriate action, Pilot	346,000		
KRATZ, Dale R.,	Undetermined with pilot (failed to	398,000	165,515	563,515
ENS, TF-9J	maintain flying speed) as most probable contributing factor			
HANSFORD, Keith G.	Pilot, (failed to maintain flying speed)	139,000	39,265	178,265
ENS, T-28C	as the single cause factor			
KAVANAUGH, M.N.,	Undetermined (violation of existing	604,000	87,500	691,500
Marcad, T-2A	regulations and instructions and failure to maintain flying speed)			
MONAGHAN, John A.,	Pilot (violation of existing regulations)	32,000	6,500	38,500
Jr., ENS, T-34B	Other personnel (pilot of other aircraft-			
Passenger on flight	violation of existing regulations)			

Name and Plane Make	Cause	Cost		
		Aircraft	Pilot	Total
HILL, Thomas M. Navcad, T-2A	Material malfunction of engine caused by foreign object. Damage as single cause factor	\$604,000	\$ 30,740	\$634,740
SEDAR, Dean Delwin ENS (Student) T-2A	Instructor Pilots (failure to see other a/c and non-conformance to VFR altitudes on airways) primary factor with other personnel (Air Force solo student failed to see other a/c) and Navy instructor (distraction by suspected malfunction)	604,000	42,110	646,110
FURROW, J.E. LTJG, T-2A	Undetermined with material (yaw damper system) and other personnel - NATOPS violation)	604,000	20,220	624,220

Five accidents with secondary medical factors, i.e. "Distraction"

"Preoccupied," failure to see other a/c, misjudged distance, etc.

Total material and training loss..... \$6,335,775

APPENDIX F

Analysis of the Efficacy of the Current Physical Examination

A review of the annual physical examinations crossing the desk of Code 511 and the Aviation Medicine Section of BuMed revealed that in annual 1966 (1 January 1966 to 31 December 1966) a total of 14,010 annual physical examinations were reviewed by Code 511. Of these 104 were rejected or reclassified. This amounts to .74% of the total or conversely 99.26% of the annual physical examinations resulted in no change in flight status. Unfortunately those 104 cases which were rejected or reclassified were not further divided by diagnosis or by systems involved and therefore an analysis was made of all cases appearing before the Aviation Medicine Council at BuMed for the same period. It should be noted that many but not all aviation crewmembers whose flight status is being downgraded due to medical causes are brought before the Council for deliberation. This of course would include pilots who had medical disqualifications that were found at times other than annual physical examinations.

In annual 1966, 430 cases were presented to the Council. However, in some cases the same man appeared on two separate occasions so that a complete tally of the log revealed only 425 separate patients. Of these 425 cases 179 were from the Department of Ophthalmology (42%), 76 were from Neurology and Neuropsychiatry (17.8%), 65 were classified as cardiovascular (15.3%), 34 cases fell into a miscellaneous group (8%), 30 were in the ENT category (7.1%), 19 were in the orthopedic area (4.5%), 8 involved gastrointestinal problems (1.9%), 8 involved metabolic problems (1.9%), and 6 concerned GU problems (1.4%). Each of the diagnosis under the system headings

were then reviewed to determine which could conceivably have been picked up in an asymptomatic individual at the time of his annual physical examination. It was found that 95.5% of the eye problems would probably have been asymptomatic and detectable only through careful examination. Sixty-eight per cent of the cardiovascular problems might have been detectable only at the time of the routine physical examination and 60% of the ENT problems could have been occult. All of the diagnoses listed under Orthopedics, GI disease, and metabolic and GU disease were probably picked up at some time other than the annual physical examination. Of the neuropsychiatric cases only 4% might have been occult and detected only at the annual physical examination. Of the miscellaneous group 14.5% would have fallen to this group as well. Therefore, when extrapolating from the Council cases to the 104 cases detected on annual physical examination we should probably concentrate primarily on the ophthalmologic, cardiovascular, and ENT categories, with a smaller emphasis on the miscellaneous. I think that it is reasonable to assume that since 95% of the ophthalmologic cases were probably occult that a significant percentage of the 104 lesions found on the annual physical examinations would be included in this group. This would probably average well over the 42% found in the Council cases as a whole. If we assume conservatively that 50% of the cases were eye cases this would leave a total of 52 annual physical examination disqualifications to be divided between ENT, cardiovascular, and miscellaneous. However, we know that of the ENT cases 60% were due to defective auditory acuity which should have been picked up on an adequate fleet-wide hearing conservation program. Of the miscellaneous group 82% were probably symptomatic.

Of the remaining 6 cases 2 would have been picked up on a routine chest screening. The major remaining category involves lesions of the cardiovascular system. Of these lesions hypertension ranging from "benign labile" to moderate hypertensive cardiovascular disease comprise the majority of the cases (27/65). Of the remaining diagnoses the majority would have been picked up electrocardiographically including such things as congenital or acquired right bundle branch block, atherosclerotic coronary heart disease, "ECG changes," and left bundle branch block.

Discussion: We have no accurate way to study in retrospect the breakdown of lesions found on the annual physical examinations. We have the total figure for 1966 and by an analysis of the council cases can make some approximation of those cases that could possibly have been missed by revision of the annual physical examination to include only a careful historical review, plus an eye examination, chest x-ray, and urinalysis. It would appear that between 20 and 40 cases would be missed by the projected revision. However, the vast majority of these fall into the cardiovascular field and involved two major categories, hypertension and electrocardiographic abnormality. Of the electrocardiographic abnormalities the revised schedule of examination, I feel, would detect the vast majority of these lesions since extensive electrocardiographic testing will be obtained at ages 23, 32, 38, 45, 50, 55, and 62. The other large category involved hypertension, the vast majority of which fell in the labile-benign group which I feel present no immediate threat to aviation safety if this is allowed to continue for the maximum of six years noted between the comprehensive physical examinations.

To detect these 20-40 cases approximately 28,400 aviators underwent annual physical examinations. A current breakdown of aviators includes 23,284 naval aviators - 14,347 of which were in a regular status, and 8,937 in a reserve status as of May 1967. The census of the Marine aviators is as follows: 3,128 regular, 1,990 reservists as of March 1, 1967 for a total of 28,402 naval and marine aviators as of May 1967. To determine the man hours involved in examining this group a questionnaire was circulated to representative aviation examining rooms throughout the naval establishment requesting an estimate of time involved by the doctor per man per annual, total time utilized by the corpsmen per man per annual, and the total time utilized by all corpsmen in area maintenance per annual. In addition, we requested the total time lost from work by the aviator during his annual physical examination. To this date answers have been received from the Naval Air Station, Glenview, Illinois, doing predominantly reserve physical examinations, from NAS, Miramar, doing predominantly active duty operational physical examinations, from Ream Field, Imperial Beach, California, performing predominantly helicopter active duty physical examinations, from the Station Hospital, Naval Air Station, Lakehurst, N.J., doing almost a balanced load of active duty and reserve physicals, NAS, Jacksonville, Florida, performing predominantly again operational active duty physical examinations.

A very conservative estimate of the time involved in these different categories reveals that the doctor devoted approximately 25 minutes per man resulting in 11,834 man hours of doctor's time. The aviator's time involved an average of 4 hours per man amounting to about 113,600 man hours of aviator's time.

The corpsmen time breaks down as follows: time spent with aviators- two hours per corpsman per man equals 56,804 man hours; in area maintenance $3\frac{1}{2}$ hours per corpsman per annual physical examination is 99,407 man hours resulting in a total of 281,653 man hours involved in obtaining physical examinations. This amounts to 112.66 man years annually. As an alternative to the present examination system a revised physical examination has been suggested to be called the "Short Form." This will include a much more extensive interval historical review on mark sense form which will be distributed to the aviator for completion away from the medical spaces prior to reporting for his annual physical examination. On the day of his examination he would report to the medical spaces where he would receive a complete eye examination utilizing the Armed Forces Vision testing apparatus which would involve about 20 minutes per man. This would be followed by a chest x-ray, consuming about 2 minutes, and a urinalysis and weight consuming another 5 minutes. He would then be interviewed by the physician and this interview would probably consume approximately 20 minutes per man. The total examination would therefore involve $\frac{3}{4}$ of an hour as compared to the prior four hour examination. The total time saving with this revision would probably amount in excess of 85,000 man hours of aviator time per year. In addition there would be a saving in excess of 50% of the corpsmen's time both with handling the aviator and in area maintenance. In addition, the clerical time involved in the submission of the 14,000 annual physical examinations at 12 minutes per annual would amount to 2800 man hours.

This could be cut to about 1640 man hours with the short form. The physician's time would be approximately the same as presently. The total time saving to the Naval establishment would approximate 175,000 man hours a year. For this saving we would gamble on missing approximately 20-40 lesions which would result in a downgrading or reclassification of flight status.

Comparative Costs

of the Personnel costs:

Cost saving in HM time/year

= 34,082 man hours or

15.86 man years.

APPENDIX H

The additional cost for doing the returning group of 50 pilots/week would be:

A. HOUSING	-	25 additional rooms will be provided in the examination unit for a metabolic holding area. There will be a small additional charge if the old Pensacola Naval Hospital is used by converting SOQ.	
B. SUBSISTENCE	-	\$1.45/man/day \$1.45 x 4 days x 50 men = \$290/week or	\$ 13,630.00/year
C. PER DIEM	-	\$24/man = \$1200/week or	56,400.00/year
D. TRAVEL	-	\$250/man = \$12,500/week or	587,500.00/year
E. OPERATING COSTS	(up 20%)		3,400.00/year
Total			<hr/> \$660,930.00/year
for 2367 pilots/year or \$280.00/exam.			

APPENDIX I

To compute the value of time gained by increased pilot availability:

$\frac{1}{2}$ day/year for 22,300 pilots (ages 23 through 38)

OR 11,150 man days/year gained.

This is equivalent to 312 flight days/year/pilot, divided into
11,150 man days/year OR 36 pilots/year at a replacement cost
of \$250,000/pilot.

This gain equals \$9,000,000 prorated over 15 years of operational
flying career equals \$600,000/year in training costs

350,000/year in pay/pilots

for a total of \$950,000/year

Gained by saving time with the new program.

MEDICALLY RELATED AVIATION COSTS

I SELECTION - COST FIGURES UNAVAILABLE - BUT NO IMMEDIATE CHANGE WITH COMPREHENSIVE EXAMINATION

II FLIGHT TRAINING

A.	ENTRY INTO PRE-FLIGHT PHYSICAL EXAMINATION \$40.00/MAN X 4000 INPUT	\$ 160,000
B.	MEDICAL ATTRITION (WITHOUT DEATHS)	
1.	NUMBER = 182 (FISCAL 1965)	
2.	COST AT \$11,000/MAN	2,000,000
C.	MORBIDITY - THESE FIGURES ARE COMBINED AND LISTED UNDER OPERATIONAL FLYING	
D.	MORTALITY	
1.	AIRCRAFT ACCIDENTS - THERE WERE 14 A/C ACCIDENTS IN FY 65 - OF THESE 2 WERE DUE TO DISORIENTATION AT A COST OF	727,000
	IN ADDITION 5 OTHER ACCIDENTS HAD SECONDARY MEDICAL FACTORS SUCH AS "DISTRACTION," "PREOCCUPIED" WITH A COST OF \$2,232,000. IF WE ASSIGN A 10% MEDICAL LIABILITY	223,200
2.	DISEASE - NONE	
		<hr/> \$3,110,200

Figure II

III OPERATIONAL COSTS

A. MEDICAL DISQUALIFICATIONS
(REJECTED OR RECLASSIFIED)
DUE TO FAILURE TO MEET STANDARDS ON
PHYSICAL EXAMINATION - 104 (1966)
AT \$250,000/REPLACEMENT. IF A 50%
REDUCTION IN AVIATION UTILIZATION
RESULTED - THIS WOULD EQUAL —————→ \$13,000,000

B. MEDICAL ABSENTEEISM - NON COMBAT
DAYS NOT FLYING IN TRAINING AND
OPERATIONAL STATUS

1. MORBIDITY
(LOCAL UNIT, NUMBER AND COST)

A. SELF MEDICATION

B. SICK CALL VISITS

C. SICK IN QUARTERS

D. OPERATIONAL NONAVAILABILITY

THESE DATA ARE UNKNOWN - ESTIMATE —————→ \$ 8,000,000

Figure 12

OPERATIONAL COSTS CONTINUED

2. MORBIDITY (HOSPITAL) FOR BOTH TRAINING AND OPERATIONAL PILOTS

A. NUMBER PER YEAR 480 (FY 65)

B. TOTAL COST - IN KOST TIME AND IN HOSPITAL MAINTENANCE COSTS AT \$45.00/DAY

\$ 770,400

3. MORTALITY - IN FISCAL 1966, 98 AVIATORS WERE KILLED IN AIRCRAFT ACCIDENTS. THE PRIMARY CAUSE WAS THE PILOT IN 42.1% OF THESE.

A. AIRCRAFT ACCIDENTS DUE TO PRIMARY MEDICAL CAUSES (5)

1. COST IN A/C. 4 JET - 1 HELO 2,306,577

2. PILOT REPLACEMENT COST 1,250,000

B. AIRCRAFT ACCIDENTS WITH SECONDARY MEDICAL CAUSES

1. NUMBER 27 COST A/C \$19,617,221
PILOT REPLACEMENT 6,750,000

TOTAL \$26,367,221

IF 10% MEDICAL LIABILITY ASSIGNED 2,636,722

OPERATIONAL COSTS CONTINUED

4. DISEASE FISCAL 1966 — 16 DEATHS

A.	INFECTION	(1)	MENINGOCOCCIC
B.	NEOPLASTIC	(3)	SKIN, LUNG, COLON
C.	ASHD	(6)	
D.	ANEURYSM	(2)	OTHER THAN HEART OR AORTA
E.	PHLEBITIS	(1)	
F.	PULMONARY INFARCT	(1)	
G.	DIVERTICULITIS	(1)	
H.	UREMIA	(1)	

COST
UNKNOWN

Figure 14

COST OF THE FIRST COMPREHENSIVE PHYSICAL EXAMINATION

1.	CAPITAL OUTLAY	—————→	ABOUT	\$400,000
	I.E. NEW EQUIPMENT		\$280,000	
	INSTALLATION. MISC.		<u>120,000</u>	
			\$400,000	
2.	OPERATING COSTS	—————→	ABOUT	97,300/YR
	A. 13 NEW C/S POSITIONS			
	AT ABOUT		\$ 80,500 YR	
	B. ROUTINE SUPPLIES		12,000 YR	
	C. AUTOMATED LABORATORY			
	SUPPLIES		<u>4,800 YR</u>	
			\$ 97,300	
3.	MAINTENANCE COSTS OF SNA'S FOR <u>SIX</u>			
	EXTRA DAYS=4430.40/WEEKS/CLASS OR	—————→	217,070/YR	
	TOTAL COST/YEAR (# 2 & 3) EQUALS	—————→	314,370	
	FOR 3000 PILOT OUTPUT OR \$104.80			
	EXTRA EXAM			
	THEREFORE TOTAL COST			
	ABOUT		\$145.00/MAN	

Figure 15

COMPARATIVE COSTS COMPREHENSIVE VERSUS PRESENT AVIATION PHYSICAL EXAMINATION

AGE	COMPREHENSIVE SYSTEM	PRESENT SYSTEM
23	\$ 145.00	\$50.00/EXAM (EXCEPT FOR INDUCTION - \$40. NAMI) TOTAL TO AGE 62 - \$1940
↓ 8 YR	22.00	
↓ 32	280.00	
↓ 5 YR	22.00	
↓ 38	280.00	
↓ 6 YR	22.00	
↓ 45	280.00	
↓ 4 YR	22.00	
↓ 50	280.00	
↓ 4 YR	22.00	
↓ 55	280.00	
↓ 6 YR	22.00	
↓ 62	280.00	
TOTAL	\$2551.00	\$1940.00

Figure 16

COMPARATIVE COSTS
PRESENT ANNUAL PHYSICAL EXAMINATION VERSUS SHORT FORM

NAMI PHYSICAL EXAMINATION				% REDUCTION	SHORT FORM	
1.	PERSONNEL COSTS	\$35.00/EXAM		45	PERSONNEL	\$19.30
2.	SUPPLIES	<u>5.00/EXAM</u>		50	SUPPLIES	<u>2.50</u>
		\$40.00				\$21.80
OF THE PERSONNEL COSTS						
	MD	20% OR	\$ 7.00	0	MD	\$ 7.00
	HM	49% OR	17.00	60	HM	6.80
	C/S	31% OR	<u>11.00</u>	50	C/S	<u>5.50</u>
			\$35.00			\$19.30
					COST SAVING IN HM TIME PER YEAR	
					\$2.26/HR X 34,082	
					\$77,025	

Figure 17

SUMMARY OF COSTS RELATED TO THE MEDICAL CARE OF AVIATORS (1965-1966)

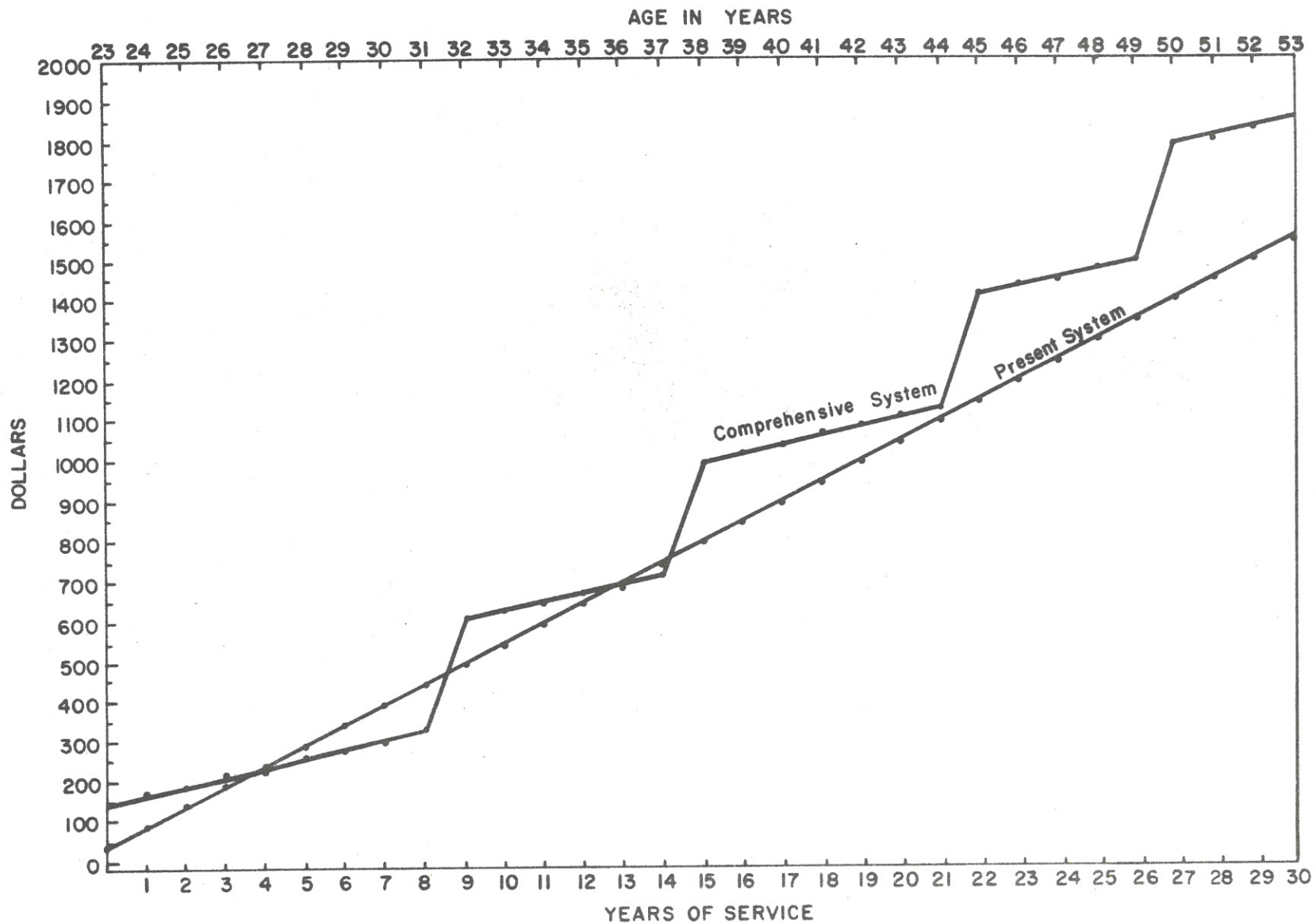
TRAINING :

1. MEDICAL DROPS	\$ 2,017,130.00
2. ABSENTEEISM (see Operational)	
3. MORBIDITY (see Operational)	
4. MORTALITY	
a) Aircraft accidents -	
Primary medical	727,000.00
Secondary medical	223,200.00
b) Diseases	NONE

OPERATIONAL :

1. MEDICAL DISQUALIFICATIONS (rejected or reclassified)	\$ 13,000,000.00
2. ABSENTEEISM	8,000,000.00
3. MORBIDITY	770,400.00
4. MORTALITY	
a) Aircraft accidents	
Primary medical	3,556,577.00
Secondary medical	2,636,722.00
b) Disease (16 deaths)	UNKNOWN
	<hr/>
	\$ 30,931,029.00

Figure 18



CUMULATIVE COST FOR PHYSICAL EXAMINATION/PILOT

Figure 19

WHY PENSACOLA?

1. HEADQUARTERS - TRAINING COMMAND
2. INDUCTION CENTER FOR ALL STUDENT NAVAL AVIATORS
3. NAVAL AEROSPACE MEDICAL CENTER
 - A. NAVAL AEROSPACE MEDICAL INSTITUTE
 1. UNIVAC 418 COMPUTER SYSTEM WITH ANALOG-TO-DIGITAL CAPABILITY AND DATA PROCESSING STAFF
 2. SPECIALIZED, EXPERIENCED AVIATION PHYSICAL EXAMINATION STAFF
 3. RESEARCH CENTER WITH FACILITIES FOR STUDY OF VERTIGO
 4. AVIATION PSYCHOLOGY DEPARTMENT WITH DATA ON APTITUDE AND PERFORMANCE
 - B. NAVAL HOSPITAL
 1. SUBSPECIALTY CONSULTANTS WITH AVIATION ORIENTATION
 2. FACILITIES FOR INPATIENT CARE AND EVALUATION

Figure 20

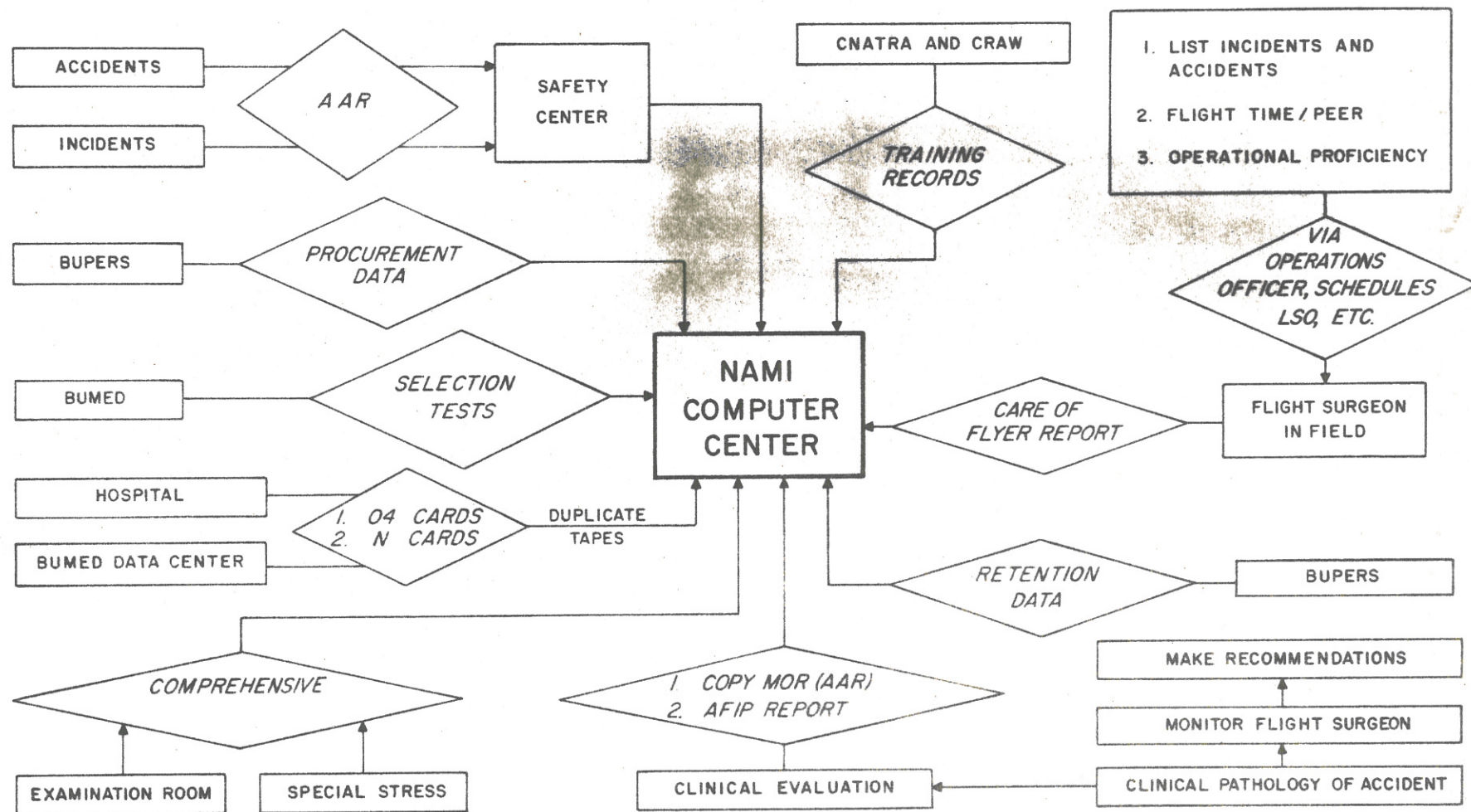


Figure 21

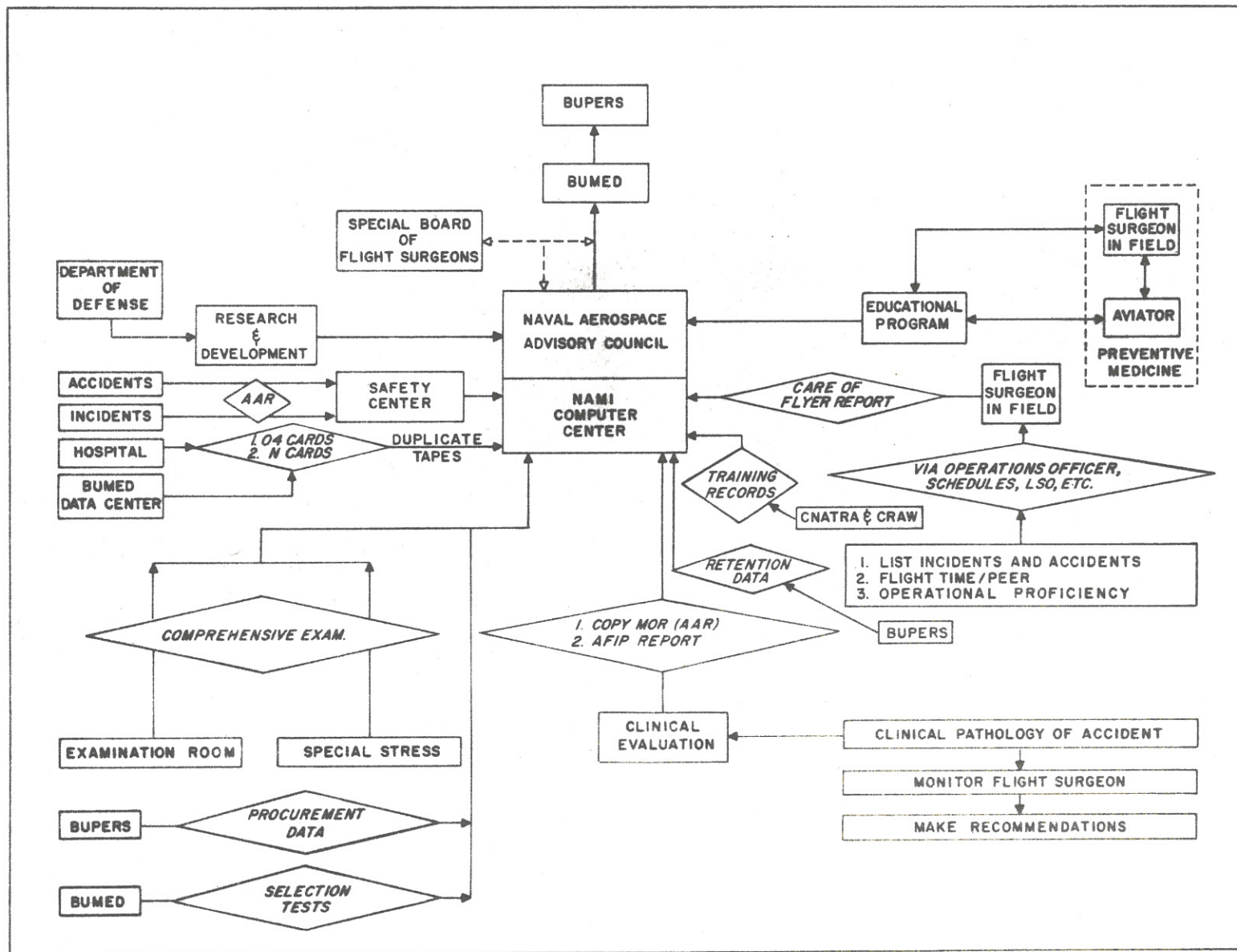


Figure 22